

# A Giant Heart-urchin

*Brissus gigas* n. sp.

## From NEW ZEALAND

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The giant heart-urchin which is the subject of this paper was taken in deep water off the Bay of Islands and is now preserved in the collection of the Auckland Museum. It is evidently an undescribed species exceeding in size any echinoid hitherto known from New Zealand waters. As set out in the discussion below, there are grounds for believing that the specimen may ultimately become the type of a new genus, but in the meantime owing to the paucity of material it has been deemed advisable to place it in the genus *Brissus*, with which it most closely agrees.

The large size of the specimen has necessitated considerable reduction of the photographic figures. As the ornamentation and other surface features of the test are relatively unaccentuated, and consequently difficult to photograph, the location of the chief features shown on Plates 13 and 14 may be indicated here before proceeding to the diagnosis. On the abactinal aspect the peripetalous fasciole, which in life would carry a band of ciliary radioles, may be discerned following a zig-zag course, enclosing the lateral and posterior pairs of petaloid ambulacra, curving sharply inwards in the intervening interambis, and tracing a broad convex sweep across the anterior part of the test. On the actinal side the large sternal plastron of the posterior interamb is delineated by its dark border, and occupies all the medial region posterior to the peristome. The sub-anal plastron, lying between the sternal plastron and the periproct, is foreshortened in this aspect, but the sub-anal fasciole by which it is circumscribed can be discerned. The latter structures are shown in full view in Text Figure 2, while Figure 1 gives details of the apical region.

Genus **BRISSUS** Leske, 1778.

Peripetalous fasciole present, but no internal nor anal fascioles; petals well formed and depressed; sub-anal fasciole complete, surrounding a distinct sub-anal plastron.

***Brissus gigas* n. sp.** Plates 13 and 14; Text Figures 1 and 2.

*Diagnosis:* Test very large and inflated, without anterior notch, broadly ovate, truncate posteriorly. Apex and peristome markedly precentral; the periproct situated on the obliquely truncate postero-ventral border of the test. Petals I, II, IV and V narrow and deeply sunken, as wide as deep. Ambulacrum III flush with test. Interambulacrum 5

keeled obliquely above, posterior to the peripetalous fasciole, and less markedly so below the sub-anal fasciole. Sternal plastron showing traces of radial fan-like furrowing and a radial arrangement of the fine tubercles on it. Primary tubercles extending within the peripetalous fasciole in interambulacra 2 and 3.

Length, 185 mm. Breadth at level of apex, 145 mm. Greatest breadth (at level of posterior extremities of petals I and V), 167 mm. Height from apex to labrum, 90 mm. Greatest height (from a point midway between apex and posterior ambitus), 100 mm.

*Locality:* Off Bay of Islands, North Auckland, New Zealand.

*Depth:* Not recorded; stated to be from "deep water." Fragments of what may be the same species have been taken at Pt. Abercrombie, Gt. Barrier Island, from an estimated depth of ca. 20 metres.

*Holotype:* In the Auckland Museum.

The specific name proposed refers to the large size of the spatangoid.

### Fuller Account.

In view of the systematic problems raised by this specimen, a fuller account follows.

The material comprises a solitary denuded test, bleached to a pale creamy colour except within the peripetalous fasciole and in interambulacra 2 and 3, which are pale greyish. When collected the test was enveloped in a coralline alga, so that it is evident that the animal had been dead for some time. No trace could be found of any adhering radioles.

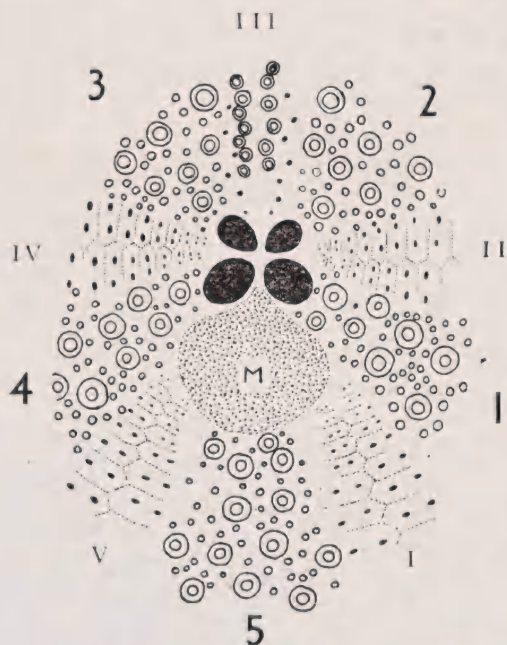


Fig. 1. Apical region. M., madreporite; I-V, Ambulacral columns; 1-5, Interambulacral columns, x 2.5.

The tuberculation extends over the whole of the interambulacral regions, but interambulacra 2 and 3 are distinguished both within and without the peripetalous fasciole by possessing larger primary tubercles. Only the primary tubercles are perforate.

The apical region (Fig. 1) is rather obscure owing to the intercalary deposition of calcite having masked the outlines of the plates. There are four gonopores, the posterior pair (in interambulacra 1 and 4) being larger and more widely separated than the anterior pair (in interambulacra 2 and 3). Ocular plates are indistinguishable and no ocular apertures can be seen. The madre pore in interambulacrum 5 is relatively large, broadly elliptical with an adapical acute angle between gonopores 2 and 5, and separates petals I and V, which are therefore not confluent proximally.

The peristome, which is anteriorly placed, below the apical region, presents a transverse crescentic outline when viewed from below, the anterior border being convex; breadth, 34 mm. The mouth, as usual, is directed antero-ventrally owing to the ventral displacement of the labrum.

The periproct is elliptical, situated on the obliquely truncate postero-ventral border of the test, below the ambitus, length 26 mm., breadth 20 mm.

The peripetalous fasciole is typical of Brissids.

The sub-anal fasciole is complete, surrounding a broadly reniform sub-anal plastron. There is no trace of an anal fasciole. As this arrangement is of generic significance, the region of the periproct is shown in Fig. 2. Breadth of sub-anal plastron, 75 mm., height at centre 27 mm.

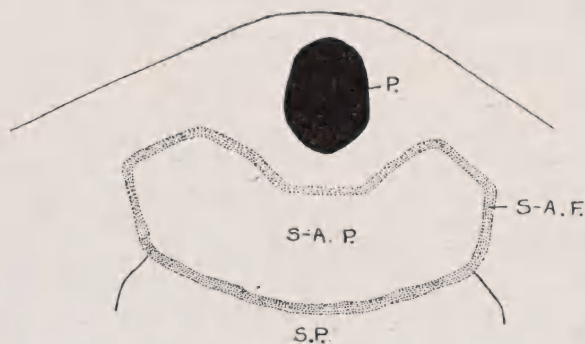


Fig. 2. Region of periproct. P., periproct; S-A.F., Sub-anal fasciole; S-A.P., Sub-anal plastron; S.P., Sternal plastron,  $\times 5$ .

The sternal plastron is in the form of an isosceles triangle, the base of which is slightly concave and formed by the ventral border of the sub-anal fasciole, and the sides are convex where they border ambulacra I and V, while the apex is truncated by the labrum. The sternum is very obliquely keeled, and is remarkable for showing distinct traces of the radial fan-like furrowing characteristic of the genus *Metalia*. Length 104 mm., greatest breadth (midway along its length), 95 mm.; breadth at base, 65 mm.



Posterior petals, I and V, distinct, not confluent at any point, commencing on either side of the madre pore, and extending postero-laterally half the distance to the ambitus; 75 mm. long, deeply sunken (maximum depth 8 mm.), narrow (maximum width 8 mm.), bearing 40 distinct pairs of pore-pairs, all (except the adapical 3 or 4) approximately equally spaced. There are in addition signs of approximately three obsolete pairs at the proximal end of each petal.

Anterior petals, II and IV, deeply sunken (maximum depth 7 mm.), narrow (maximum width 7 mm.), the proximal two-thirds of each petal directed very slightly posteriorly, so as to form an obtuse angle with ambulacrum III. The distal one-third of each petal curves slightly anteriorly. Length of each petal 70 mm., extending seven-tenths of the meridional distance from the apex to the ambitus. There are 36 distinct pairs of pore-pairs, but as there are approximately five more obsolete proximal sets, the total will be about 41 for each petal.

The anterior ambulacrum III is for the most part flush with the test, save at the ventral extremity near the peristome. There are 32 pairs of solitary pores, some obsolete. The ambulacrum bears a median groove, 2 mm. wide, bordered on either side by a double or triple line of secondary tubercles, so that in general structure it resembles a fasciole; and perhaps performs a ciliary feeding function since it leads directly to the mouth. This ambulacrum is obsolete over a short distance below the fasciole, save for a few pores. The fasciole cuts it some 25 mm. above the ambitus, i.e., approximately two-thirds of the meridional distance along the ambulacrum from the apex to the ambitus. The obsolete section of the ambulacrum is responsible for the absence of an anterior notch from the ambitus.

There is nothing remarkable about any of the interambulacra, save the dorsal and ventral keel of interambulacrum 5, already described.

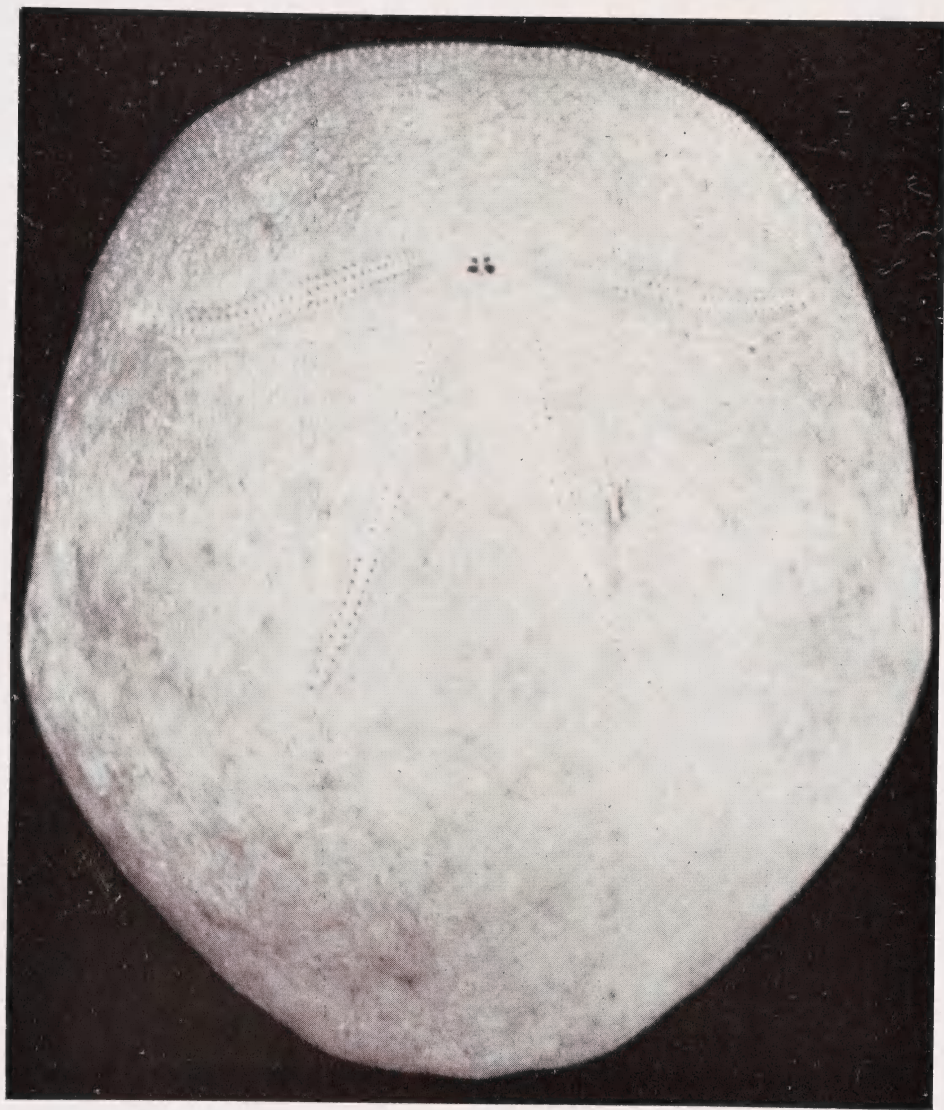
### Systematic Position of *Brissus gigas*.

It can be seen that the characters of the species so far as can be determined from the test are in accordance with the diagnosis of *Brissus*, quoted above (from H. L. Clark, 1925). The only unexpected feature is the very large size.

On the other hand, if the species is assigned to *Brissus*, some anomaly results from the fact that others of its characters accord better with the genera *Metalia* and *Meoma*.

In a private communication Dr. Th. Mortensen, of Copenhagen, remarks on the general resemblance of the animal to *Metalia*, a genus which sometimes reaches a size approaching that of the present example. Both Ludwig (1904) and Tenison-Woods (1878) have drawn attention to the radial furrowing of the sternum in *Metalia*. The former gives it as the sole distinguishing feature from *Brissus*; but as now recognized, *Metalia* is also characterised by possessing anal fascioles. The latter are lacking in *B. gigas*, and as Mortensen regards this as an important diagnostic feature, it does not seem advisable to place the species in *Metalia*. According to H. L. Clark (1925) a diagnostic feature of *Metalia* is the absence of large primary tubercles from within the peri-





*Brissus gigas* n. sp. Abactinal view of test  $\times 3/5$ .

petalous fasciole. *B. gigas* possesses such tubercles, which would also argue against placing it in *Metalia*. On the other hand, Tenison-Woods (1878) has recorded that the Australian species of *Metalia* possess the common feature "tuberculation within the peripetalous fasciole coarse, frequently consisting of primary tubercles." Owing to lack of material it is not possible for the writer to check these discordant statements. According to Jackson (1912) *Metalia* is notable in having both the primary and secondary tubercles perforate. *B. gigas* has only the primary tubercles perforate. Thus the main part of the evidence seems to weigh against assigning the species to *Metalia*, with which in general form, size and furrowing of the plastron it otherwise shows agreement.

The genus *Meoma* possesses a test of size and form comparable to *B. gigas*, and has similarly sunken petals. In this case disagreement occurs in the structure of the sub-anal fasciole, which is complete in *B. gigas*, whereas the diagnosis of *Meoma* given by H. L. Clark (1925) states that the sub-anal fasciole is imperfect, so that there is no well-marked sub-anal plastron. The anal fascioles are absent in *Meoma*, a point in respect of which *B. gigas*, *Brissus* s. s. and *Meoma* all correspond.

Owing to the fact that only the one test is available the species is recorded here under *Brissus*. When more material is obtained it will be possible to see how far the characters of the type specimen are normal ones and to what extent individual variation is involved; the characters of the exoskeleton and internal organs will also have an important bearing. If the characters described above prove to be constant, then it may be preferable to erect a separate genus, the characters of which would probably include the following:—

Test large, wide and inflated, without anterior notch; Peripetalous fasciole and sub-anal fasciole present, but no anal fasciole. Petals well formed and depressed. Sub-anal plastron wide, reniform. Sternal plastron large, bearing radiating fan-like furrows arising from the posterior margin. Primary tubercles extending within the peripetalous fasciole, and only the primary tubercles perforate.

Whether this combination of characters distinctive of various genera indicates a primitive condition or a case of convergence it is not possible at present to say. The large size would seem to count against the possibility of *B. gigas* being a primitive form.

### Acknowledgment.

I am indebted to Mr. A. W. B. Powell for the opportunity of reporting on this specimen; and to Dr. Th. Mortensen, of the Copenhagen Museum, who kindly gave his opinion on the generic problem involved.

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### REFERENCES.

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*Brissus gigas* n. sp. Actinal view of test x 3/5.